

EXHIBIT A

CLAIMS FOR
U.S. PATENT NO. 6,015,913

6,015,913

27

28

TABLE 5

		Defatted Dry Weight Basis									
		Oligomer Amount (µg/g)									Total
Sample	Description	Monomer	Dimer	Trimer	Tetramer	Pentamer	Hexamer	Heptamer	Octamer	Nonamer	Polyphenol
M1	Inventive Process Sulawesi Cake Heat during conching (60°)	5904	3084	2174	1251	1190	445	229	100	trace	14379
M2	Inventive Process Sulawesi Cake No heat during conching (32°)	6479	3239	2281	1380	1292	502	260	119	trace	15552
M3	Inventive Process Sulawesi Beans Conventional lab roasting and milling (60°)	6123	2623	1273	455	472	74	ND	ND	ND	11020
S1	Comparative, Conventional screw press solids - Sulawesi Cake Heat during conching (60°)	2920	1503	884	416	327	108	21	ND	ND	6178
S2	Comparative, Conventional screw press solids - Sanchez Cake Heat during conching (60°)	3782	2106	1505	753	571	163	60	ND	ND	8940
S3	Comparative, Conventional screw press solids - Ivory Coast Cake Heat during conching (60°)	1708	1088	750	387	244	56	ND	ND	ND	4233

TABLE 6

Sensory Evaluation of Plain Chocolate made from inventive solids vs. conventionally processed cocoa solids or beans								
Flavor characteristics and intensities* (10 cm scale)								
sample	Chocolate/ cocoa	Roast	Fruity/ Floral	Brown Fruit/ Spice	Particle Size	Bitter	Astringent	Woody
M-1	5.4	4.2	2.6	—	2.9	6.5	5.8	2.5
M-2	4.6	2.8	1.5	1.7	3.4	5.9	6.6	4.2
M-3	4.0	3.5	—	5.1	3.3	8.0	7.2	7.8
S-1	4.5	3.9	1.6	2.6	2.6	3.6	3.9	4.9*
S-2	5.9	4.0	2.7	2.8	3.5	7.4	6.2	—
S-3	6.6	4.1	3.9	3.2	3.4	8.3	6.3	3.7

*Scores represent the average of 9 trained chocolate tasters. "—" = statistically insignificant "a" = burnt coffee grounds flavor detected

Codes	Description
M-1	Inventive Process heat, 120 psi, PTE 3-4/08
M-2	Inventive Process no heat conching, PTE 3-4/08
M-3	Nibs, Sulawesi, conventional roast beans, PTE 3-4/08
S-1	Comparative, conventional screw press solids-Sulawesi
S-2	Comparative, conventional screw press solids-Sanchez
S-3	Comparative, conventional screw press solids-Ivory Coast

Having thus described in detail the preferred embodiments of the present invention, it is to be understood that the invention defined by the appended claims is not to be limited by particular details set forth in the above descriptions as many apparent variations thereof are possible without departing from the spirit or scope of the present invention.

What we claim is:

1. A method of processing cocoa beans to cocoa butter and partially defatted cocoa solids, wherein said cocoa beans

consist essentially of a shell surrounding nib, which method comprises the steps of:

- heating said cocoa beans for a time and at an internal bean temperature sufficient to loosen said cocoa shell without roasting said nib;
- winnowing said cocoa nibs from said cocoa shells;
- screw pressing said cocoa nibs to produce cocoa butter and partially defatted cocoa solids; and

6,015,913

29

- (d) recovering said cocoa butter and said partially defatted cocoa solids, which cocoa solids contain cocoa polyphenols including cocoa procyanidins from said unroasted cocoa nibs.
2. The method of claim 1, wherein said cocoa beans are heated to an internal bean temperature of about 100° C. to about 110° C.
3. The method of claim 1, wherein said cocoa beans are heated to an internal bean temperature of less than about 105° C.
4. The method of claim 1, wherein said cocoa beans are heated by infra red heating.
5. The method of claim 1, wherein said winnowing is carried out in an air fluidized bed density separator.

30

6. The method of claim 1, further comprising the step of cleaning said cocoa beans prior to said heating step.
7. The method of claim 6, wherein said cleaning step is carried out in an air fluidized bed density separator.
8. The method of claim 1, further comprising the step of milling said cocoa solids to a cocoa powder.
9. The method of claim 1, further comprising the step of solvent extracting said cocoa polyphenols including said cocoa procyanidins from said partially defatted cocoa solids.
10. The method of claim 1, further comprising the step of alkalizing said partially defatted cocoa solids.

* * * * *

CLAIMS FOR
U.S. PATENT NO. 6,372,267

US 6,372,267 B1

27

28

TABLE 5-continued

Sample	Description	Oligomer Amount (ug/g)									Total
		Monomer	Dimer	Trimer	Tetramer	Pentamer	Hexamer	Heptamer	Octamer	Nonamer	
S2	Sulawesi Cake Heat during conching (60°) Comparative, Conventional screw press solids — Sanchez Cake Heat during conching (60°)	3782	2106	1505	753	571	163	60	ND	ND	8940
S3	Comparative, Conventional screw press solids — Ivory Coast Cake Heat during conching (60°)	1708	1088	750	387	244	56	ND	ND	ND	4233

TABLE 6

Sensory Evaluation of Plain Chocolate made from inventive solids vs. conventionally processed cocoa solids or beans								
Flavor characteristics and intensities* (10 cm scale)								
sample	Chocolate/ cocoa	Roast	Fruity/ Floral	Brown Fruit/ Spice	Particle Size	Bitter	Astringent	Woody
M-1	5.4	4.2	2.6	—	2.9	6.5	5.8	2.5
M-2	4.6	2.8	1.5	1.7	3.4	5.9	6.6	4.2
M-3	4.0	3.5	—	5.1	3.3	8.0	7.2	7.8
S-1	4.5	3.9	1.6	2.6	2.6	3.6	3.9	4.9*
S-2	5.9	4.0	2.7	2.8	3.5	7.4	6.2	—
S-3	6.6	4.1	3.9	3.2	3.4	8.3	6.3	3.7

*Scores represent the average of 9 trained chocolate tasters.

— = statistically insignificant

*burst coffee grounds flavor detected

Cocoa Description

M-1	Inventive Process heat, 120 psi, PTE 3-4/08
M-2	Inventive Process no heat conching, PTE 3-4/08
M-3	Nibs, Sulawesi, conventional roast beans, PTE 3-4/08
S-1	Comparative, conventional screw press solids — Sulawesi
S-2	Comparative, conventional screw press solids — Sanchez
S-3	Comparative, conventional screw press solids — Ivory Coast

Having thus described in detail the preferred embodiments of the present invention, it is to be understood that the invention defined by the appended claims is not to be limited by particular details set forth in the above descriptions as many apparent variations thereof are possible without departing from the spirit or scope of the present invention.

What we claim is:

1. A food composition comprising partially defatted cocoa solids which are prepared by a method which comprises the steps of:

- (a) heating cocoa beans for a time and at an internal bean temperature just sufficient to loosen the cocoa shells without roasting the cocoa nibs;
- (b) winnowing the cocoa nibs from the cocoa shells;
- (c) screw pressing the cocoa nibs to produce cocoa butter and partially defatted cocoa solids; and

(d) recovering the partially defatted cocoa solids, which cocoa solids contain cocoa polyphenols including cocoa procyanidins from the unroasted cocoa nibs.

2. The food composition of claim 1, which is a chocolate-flavored food product.
3. The food composition of claim 1, which is a chocolate food product.
4. The food composition of claim 1, which is a chocolate confectionery.
5. The food composition of claim 1, which is a chocolate-flavored confectionery.
6. The food composition of claim 4, which is an SOI chocolate confectionery.
7. The food composition of claim 4, which is a non-SOI chocolate confectionery.
8. The food composition of claim 7, which is a low fat chocolate.

US 6,372,267 B1

29

9. The food composition of claim 1, which is a chocolate drink.

10. The food composition of claim 1, which is a chocolate-flavored drink.

11. The food composition of claim 1, wherein the food product is a chocolate-coated food product.

12. The food composition of claim 11, wherein the chocolate-coated food product contains a caramel, a nougat, a fruit piece, a nut, or a wafer.

13. The food composition of claim 11, wherein the chocolate-coated food product is a chocolate-coated inclusion which contains a cordial cherry or peanut butter.

14. The food composition of claim 11, which is a chocolate-coated dessert.

15. The food composition of claim 11, which is a chocolate-coated ice cream.

16. A dietary composition comprising partially defatted cocoa solids prepared by a method which comprises the steps of:

- a) heating cocoa beans for a time and at an internal bean temperature just sufficient to loosen the cocoa shells without roasting the cocoa nibs;
- b) winnowing the cocoa nibs from the cocoa shells;
- c) screw pressing the cocoa nibs to produce cocoa butter and partially defatted cocoa solids; and

30

d) recovering the partially defatted cocoa solids, which cocoa solids contain cocoa polyphenols including cocoa procyanidins from the unroasted cocoa nibs.

17. A therapeutic composition comprising partially defatted cocoa solids prepared by a method which comprises the steps of:

- a) heating cocoa beans for a time and at an internal bean temperature just sufficient to loosen the cocoa shells without roasting the cocoa nibs;
- b) winnowing the cocoa nibs from the cocoa shells;
- c) screw pressing the cocoa nibs to produce cocoa butter and partially defatted cocoa solids; and
- d) recovering the partially defatted cocoa solids, which cocoa solids contain cocoa polyphenols including cocoa procyanidins from the unroasted cocoa nibs.

18. The composition of claims 1, 16 or 17, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, mixtures of slaty and purple cocoa beans, mixtures of purple and brown cocoa beans, or mixtures of slaty, purple and brown cocoa beans.

19. The composition of claim 18, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, or mixtures thereof.

* * * * *

CLAIMS FOR
U.S. PATENT NO. 6,737,088

US 6,737,088 B1

25

and a wet conching step was initiated. The wet conching process lasted 45 minutes at 60° C. to obtain a homogeneous mass of chocolate. The chocolate was subsequently tempered and molded into 28 g blocks for sensory evaluation as

26

limitation, Standard of Identity (U.S.) and non-standard of identity (U.S.) and reduced fat chocolates, as well as other edible compositions, containing high or conserved concentrations of active polyphenols.

TABLE 5

		Decaffeinated Dry Weight Basis									
		Oligomer Amount (µg/g)									Total Polyphenol
Sample	Description	Mono-mer	Dimer	Trimer	Tetra-mer	Penta-mer	Hexamer	Hepta-mer	Octa-mer	Nonamer	
M1	Inventive Process Sulawesi Cake Heat during conching (60°)	5904	3084	2174	1251	1190	445	229	100	trace	14179
M2	Inventive Process Sulawesi Cake No heat during conching (32°)	6479	3239	2281	1380	1292	502	260	119	trace	15552
M3	Inventive Process Sulawesi Beans Conventional lab roasting and milling (60°)	6123	2623	1273	455	472	74	ND	ND	ND	11920
S1	Comparative, Conventional screw press solids - Sulawesi Cake Heat during conching (60°)	2920	1503	884	416	327	108	21	ND	ND	6178
S2	Comparative, Conventional screw press solids - Sanchez Cake Heat during conching (60°)	3782	2106	1505	753	571	163	60	ND	ND	8940
S3	Comparative, Conventional screw press solids - Ivory Coast Cake Heat during conching (60°)	1708	1088	750	387	244	56	ND	ND	ND	4233

TABLE 6

Sensory Evaluation of Plain Chocolate made from inventive solids vs. conventionally processed cocoa solids or beans									
Flavor characteristics and intensities* (10 cm scale)									
sample	Chocolate/cocoa	Roast	Fruity/Floral	Brown Fruit/Spice	Particle Size	Bitter	Astringent	Woody	
M-1	5.4	4.2	2.6	—	2.9	6.5	5.8	2.5	
M-2	4.6	2.8	1.5	1.7	3.4	5.9	6.6	4.2	
M-3	4.0	3.5	—	5.1	3.3	8.0	7.2	7.8	
S-1	4.5	3.9	1.6	2.6	2.6	3.6	3.9	4.9*	
S-2	5.9	4.0	2.7	2.8	3.5	7.4	6.2	—	
S-3	6.6	4.1	3.9	3.2	3.4	8.3	6.3	3.7	

*Scores represent the average of 9 trained chocolate tasters.

— = statistically insignificant

* = burnt coffee grounds flavor detected

Codes	Description
M-1	Inventive Process heat, 120 psi, PTE 3-4/08
M-2	Inventive Process no heat conching, PTE 3-4/08
M-3	Nibs, Sulawesi, conventional roast beans, PTE 3-4/08
S-1	Comparative, conventional screw press solids-Sulawesi
S-2	Comparative, conventional screw press solids-Sanchez
S-3	Comparative, conventional screw press solids-Ivory Coast

described above. The particle size by micrometer of the final chocolate was 11 microns.

As shown below in Tables 5 and 6, chocolate from solids from the inventive process (Samples M1, M2) were surprisingly high in active polyphenols, and have acceptable flavor characteristics. This is surprising because the active polyphenols were not lost in processing the solids into an edible chocolate; and, because the active polyphenols did not adversely affect flavor.

The skilled artisan, without undue experimentation, from this disclosure and the knowledge in the art, can now readily prepare other chocolate compositions, including without

55

Having thus described in detail the preferred embodiments of the present invention, it is to be understood that the invention defined by the appended claims is not to be limited by particular details set forth in the above descriptions as many apparent variations thereof are possible without departing from the spirit or scope of the present invention.

What is claimed is:

1. A cocoa extract which contains cocoa polyphenols, which is prepared by:

(a) heating cocoa beans, which consist essentially of shells surrounding nibs, to an internal bean temperature sufficient to loosen the cocoa shells without roasting the cocoa nibs;

65

US 6,737,088 B1

27

- (b) winnowing the cocoa nibs from the cocoa shells;
 - (c) screw pressing the cocoa nibs;
 - (d) recovering cocoa butter and cocoa solids which contain cocoa polyphenols; and
 - (e) extracting the cocoa solids with a solvent to obtain the extract containing the cocoa polyphenols.
2. The cocoa extract of claim 1, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, mixtures of slaty and purple cocoa beans, mixtures of purple and brown cocoa beans, or mixtures of slaty, purple, and brown cocoa beans.
3. The cocoa extract of claim 1, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, or mixtures thereof.

28

- 4. The cocoa extract of claim 1, wherein the cocoa beans are Sulawesi cocoa beans.
- 5. The cocoa extract of claim 1, wherein the cocoa beans are heated to an internal bean temperature of about 100° to 110° C.
- 6. The cocoa extract of claim 1, wherein the cocoa beans are heated to an internal bean temperature of less than about 105° C.
- 7. The cocoa extract of claim 1, wherein the cocoa beans are heated by infrared heating.

* * * * *

CLAIMS FOR
U.S. PATENT NO. 6,777,005

US 6,777,005 B1

27

40. Tanabe, X., Ikegami, Y., Ishida, R. and Andoh, T., Inhibition of Topoisomerase II by Antitumor Agents bis (2,6-dioxopiperazine) Derivatives, *Cancer Research*, 51, 4903-4908 (1991).
41. Van Oosten, C. W., Poot, C. and A. C. Hensen, The Precision of the Swift Stability Test, *Fette, Seifen, Anstrichmittel*, 83:4, 133-135 (1981).
42. Wang, J. C., DNA Topoisomerases, *Ann. Rev. Biochem.*, 54, 665-697 (1985).
43. Warters, R. L., Lyons, B. W., Li, T. M. and Chen, D. J., Topoisomerase II Activity in a DNA Double-Strand Break Repair Deficient Chinese Hamster Ovary Cell Line, *Mutat. Res.*, 254:167 (1991).
44. Yamashita, Y., Kawada, S. -Z. and Nakano, H., Induction of Mammalian Topoisomerase II Dependent DNA Cleavage by Nonintercalative Flavonoids, Genistein and Orbol., *Biochem Pharm.*, 39:4, 737-744 (1990).
45. Yamashita, Y., Kawada, S. -Z., Fujii, N. and Nakano, H., Induction of Mammalian DNA Topoisomerase I and II Mediated DNA Cleavage by Saintopin, a New Antitumor Agent from Fungus, *Biochem.*, 30, 5838-5845 (1991).
What is claimed is:
1. A food comprising therapeutically effective amount of a food additive, wherein the food additive comprises a mixture of cocoa polyphenols, which mixture comprises catechin, epicatechin, and cocoa procyanidin oligomers thereof and which mixture is prepared by reducing cocoa beans to a cocoa powder, defatting the cocoa powder, and extracting the cocoa polyphenols from the cocoa powder.

28

2. The food of claim 1, wherein the procyanidin oligomers are selected from the group consisting of dimers through dodecamers.
3. The food of claim 1, wherein the cocoa polyphenols are fractionated into cocoa procyanidin fractions containing monomers, dimers, trimers, tetramers, pentamers, hexamers, heptamers, octamers, nonamers, decamers, undecamers, and dodecamers.
4. The food of claim 3, wherein two or more of the cocoa fractions are pooled.
5. The food of claim 1, wherein reducing the cocoa beans to the cocoa powder comprises the steps of freeze drying the cocoa beans and pulp, depulping the freeze dried cocoa mass, dehulling the freeze dried cocoa beans, and grinding the dehulled cocoa beans.
6. The food of claim 5, wherein the freeze dried cocoa beans are unfermented cocoa beans.
7. The food of claim 5, wherein the freeze dried cocoa beans are partially fermented cocoa beans.
8. The food of claim 5, wherein the freeze dried cocoa beans are fermented cocoa beans.
9. The food of claim 1, wherein the extracting is carried out with acetone and water, methanol and water, or ethyl acetate.
10. The food of claim 1, wherein the cocoa extract is partially purified by gel permeation chromatography and/or high pressure liquid chromatography.
11. The food of claim 10, wherein the partially purified cocoa extract is a xanthine-alkaloid free cocoa extract.

* * * * *

CLAIMS FOR
U.S. PATENT NO. 6,905,715

US 6,905,715 B1

27

28

TABLE 5

Sample	Description	Oligomer Amount (µg/g)									Total
		Monomer	Dimer	Trimer	Tetramer	Pentamer	Hexamer	Heptamer	Octamer	Nonamer	
M1	Inventive Process Sulawesi Cake Heat during conching (60°)	5904	3084	2174	1251	1190	445	229	100	trace	14379
M2	Inventive Process Sulawesi Cake No heat during conching (32°)	6479	3239	2281	1380	1292	502	260	119	trace	15552
M3	Inventive Process Sulawesi Beans Conventional lab roasting and milling (60°)	6123	2623	1273	455	472	74	ND	ND	ND	11020
S1	Comparative, Conventional screw press solids - Sulawesi Cake Heat during conching (60°)	2920	1503	884	416	327	108	21	ND	ND	6178
S2	Comparative, Conventional screw press solids - Sanchez Cake Heat during conching (60°)	3782	2106	1505	753	571	163	60	ND	ND	8940
S3	Comparative, Conventional screw press solids - Ivory Coast Cake Heat during conching (60°)	1708	1068	750	387	244	56	ND	ND	ND	4233

TABLE 6

Sensory Evaluation of Plain Chocolate made from inventive solids vs. conventionally processed cocoa solids or beans								
Flavor characteristics and intensities* (10 cm scale)								
sample	Chocolate/ cocoa	Roast	Fruity/ Floral	Brown Fruit/ Spice	Particle Size	Bitter	Astringent	Woody
M-1	5.4	4.2	2.6	—	2.9	6.5	5.8	2.5
M-2	4.6	2.8	1.5	1.7	3.4	5.9	6.6	4.2
M-3	4.0	3.5	—	5.1	3.3	8.0	7.2	7.8
S-1	4.5	3.9	1.6	2.6	2.6	3.6	3.9	4.9*
S-2	5.9	4.0	2.7	2.8	3.5	7.4	6.2	—
S-3	6.6	4.1	3.9	3.2	3.4	8.3	6.3	3.7

*Scores represent the average of 9 trained chocolate testers. "—" = statistically insignificant

*a" = burnt coffee grounds flavor detected

Codes Description

M-1 Inventive Process heat, 120 psi, PTE 3-4/08
M-2 Inventive Process no heat conching, PTE 3-4/08
M-3 Nibs, Sulawesi, conventional roast beans, PTE 3-4/08
S-1 Comparative, conventional screw press solids-Sulawesi
S-2 Comparative, conventional screw press solids-Sanchez
S-3 Comparative, conventional screw press solids-Ivory Coast

Having thus described in detail the preferred embodiments of the present invention, it is to be understood that the invention defined by the appended claims is not to be limited by particular details set forth in the above descriptions as many apparent variations thereof are possible without departing from the spirit of scope of the present invention.

We claim:

1. Partially defatted cocoa solids which are prepared by a method which comprises the steps of:

- (a) heating cocoa beans, which consist essentially of cocoa shells surrounding cocoa nibs, to an internal bean temperature sufficient to loosen the cocoa shells without roasting the cocoa nibs;
- (b) winnowing the cocoa nibs from the cocoa shells;
- (c) pressing the cocoa nibs to produce cocoa butter and partially defatted cocoa solids; and

US 6,905,715 B1

29

(d) recovering the cocoa butter and the partially defatted cocoa solids, wherein the cocoa solids contain cocoa polyphenols.

2. The cocoa solids of claim 1, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, mixtures of slaty and purple cocoa beans, mixtures of purple and brown cocoa beans, or mixtures of slaty, purple, and brown cocoa beans.

3. The cocoa solids of claim 2, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, or mixtures thereof.

4. The cocoa solids of claim 1, wherein the cocoa beans are Sulawesi cocoa beans.

5. The cocoa solids of claim 1, wherein the cocoa beans are heated to an internal bean temperature of about 100° to 110° C. and wherein the cocoa nibs are screw pressed.

6. The cocoa solids of claim 5, wherein the cocoa beans are heated to an internal bean temperature of less than about 105° C. and wherein the cocoa nibs are screw pressed.

30

7. The cocoa solids of claim 6, wherein the cocoa beans are heated by infrared heating.

8. The cocoa solids of claim 1, which are useful in a dietary composition.

9. The cocoa solids of claim 1, which are useful in a therapeutic composition.

10. The cocoa solids of claim 1, which are useful in a veterinary composition.

11. The cocoa solids of claim 1, wherein the cocoa polyphenols are catechin, epicatechin and procyanidin oligomers thereof.

12. The cocoa solids of claim 11, wherein the oligomers are selected from the group consisting of dimers, trimers, tetramers, pentamers, hexamers, heptamers, octamers, and nonamers.

* * * * *

US 6,737,088 B1

27

- (b) winnowing the cocoa nibs from the cocoa shells;
- (c) screw pressing the cocoa nibs;
- (d) recovering cocoa butter and cocoa solids which contain cocoa polyphenols; and
- (e) extracting the cocoa solids with a solvent to obtain the extract containing the cocoa polyphenols.

2. The cocoa extract of claim 1, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, mixtures of slaty and purple cocoa beans, mixtures of purple and brown cocoa beans, or mixtures of slaty, purple, and brown cocoa beans.

3. The cocoa extract of claim 1, wherein the cocoa beans are slaty cocoa beans, purple cocoa beans, or mixtures thereof.

28

4. The cocoa extract of claim 1, wherein the cocoa beans are Sulawesi cocoa beans.

5. The cocoa extract of claim 1, wherein the cocoa beans are heated to an internal bean temperature of about 100° to 110° C.

6. The cocoa extract of claim 1, wherein the cocoa beans are heated to an internal bean temperature of less than about 105° C.

7. The cocoa extract of claim 1, wherein the cocoa beans are heated by infrared heating.

* * * * *